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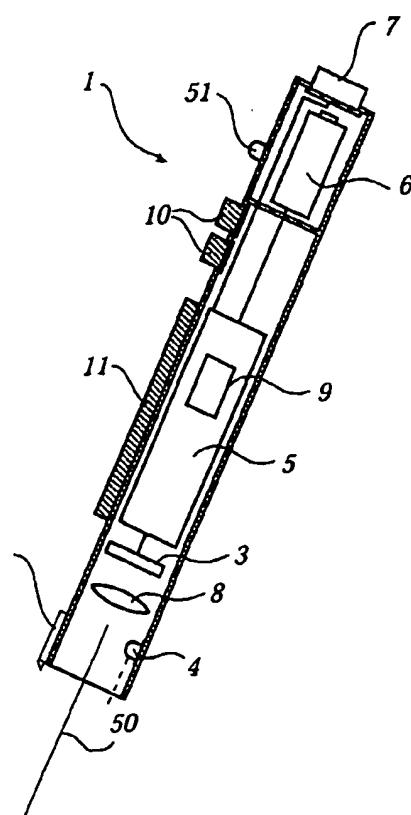
(57) Abstract: A printer (1) comprises a nozzle (2) for dispensing
dye on a surface. The printer (1) also comprises an image sensor
(3) for recording an image (16) of the surface, the printer (1) being
adapted to print on the surface with the aid of the recorded image
(16). The printer is adapted to convert the recorded image into at
least one recorded position in the form of two coordinates, in re-
sponse to the recorded image containing a position-coding pattern
(13) coding at least one position.

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PRINTER

Field of the Invention

The present invention relates to a printer for dispensing dye on a surface.

Background of the Invention

5   The use of computers continuously increases in
society. Computers have significantly facilitated the
processing of information. Although computers can pre-
sent information on displays, there is a need for print-
ing information on paper. Generally computers are con-
10   nected to a printer in a network.

The use of portable computers increases more and
more. To benefit maximally by the fact that they are
portable, they must be connected to a portable printer.
There are a large number of printers on the market which
15   operate according to a number of different principles.
Essentially two kinds of printer are presently used, viz.
laser printers and inkjet printers. Laser printers are
based on parts of a sheet of paper being charged with
static electricity. On the charged parts of the sheet,
20   toner is applied which adheres owing to the static elec-
tricity. Then the toner is made to stick to the sheet by
burning. Inkjet printers operate in such manner that the
sheet of paper is made to pass an inkjet head which is
adapted to move back and forth perpendicular to the plane
25   of the sheet. The inkjet head sprays ink according to a
pattern which is stored in digital form. A common feature
of both types of printer is that they are relatively
bulky and thus inconvenient to carry along.

The United States patent 5,927,872 describes a
30   system and a method of printing an image on a paper using
a handheld printer. The printer detects its change in
position by comparing successively registered images of
the surface of the paper. A user marks the position where

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the image is to be printed and moves the printer over the
paper in order to print the image. The relative positions
of a number of different images depends on the position
where the user initialise the printing. If the user lifts
5   the printer during printing it may be difficult for the
printer to continue printing at the correct position.

There is thus a need for a new kind of compact
printer which can easily be carried by a user and which
can resume the printing process after an interrupt.

10   Summary of the Invention

An object of the present invention is to provide
a small and compact printer.

A further object of the present invention is to
provide a printer which need not be in contact with the
15   edges of the base on which printing is carried out.

One more object of the present invention is to pro-
vide a printer which can be used to print on the surface
of a base of arbitrary shape.

Another object of the present invention is to pro-
20   vide a method for printing information on the surface of
a base of arbitrary shape.

Still a further object of the present invention is
to provide a printer which can resume the printing
process after an interrupt.

25   A basic concept of the present invention is to use
information on the surface of the base, on which surface
information is to be printed, to decide whether printing
is to occur.

A printer according to one aspect of the present
30   invention comprises means for printing on a surface and
an image sensor for recording an image of the surface,
said printer being adapted to print on the surface with
the aid of the recorded image and graphic information
that is to be printed. The printer is adapted to convert
35   the recorded image into at least one recorded position in
the form of two coordinates, in response to the recorded
image containing a position-coding pattern coding at

least one position.

The printing may be performed with various means such as, e.g. a ballpoint dispensing ink, a point which burns the surface to be printed, a point which applies a

5   pressure to the surface, thereby blackening the surface.

A printer according to another aspect of the invention comprises a nozzle for dispensing dye on a surface. The printer is characterised in that the printer is adapted to dispense dye on the surface with the aid of

10   the recorded position.

As the printer determines its position from the surface the printing may be resumed at the correct position after an interrupt.

By dispensing is here meant that the dye is dispens-

15   ed from the nozzle. According to this aspect the printing means is a nozzle.

According to an embodiment of the invention, the nozzle is a conventional inkjet head.

The dye is preferably dissolved in a liquid, but

20   within the scope of the invention the dye can also be pulverulent.

Preferably the dye is ordinary ink, but it can also be some other suitable dye.

By the printer being adapted to record an image of

25   the surface and printing with the aid of information in the recorded image, the printer need not detect the outer edges of the sheet of paper, which is the case in conventional printers which make use of direct or indirect knowledge of the location of the sheet in the

30   printing operation. This means that the printer can be made extremely small.

Preferably, the printer also comprises a memory for storing graphic information in the form of a plurality of graphics positions.

35   By graphic information is here meant images or text that can be printed on a surface.

According to a less preferred embodiment, the

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printer communicates with an exterior memory containing the graphic information.

The printer is advantageously adapted to convert text and images that are to be printed, into said plu-
5   rality of graphics positions. As a result, information that is to be printed using the printer can be entered as text. It is graphic information that is printed using the printer.

The printer is advantageously adapted to convert the
10 recorded image into at least one recorded position in the form of two coordinates, in response to the recorded image containing a position-coding pattern which codes at least one position.

By adapting the printer to determine a recorded
15 position starting from a position-coding pattern, it can easily determine its position. When moving the printing means and the image sensor over the surface, an image corresponding to the graphic information will thus gradually develop.

20 According to a less preferred embodiment, the printer can determine relative movements by comparing different images with each other. With the aid of record-ed images, the printer can decide how much it has been moved by putting together recorded images and thus
25 printing so that the graphic information is printed. However, this is considerably more complicated.

The printer is advantageously adapted to transform the graphics positions in the graphic information in response to an input signal containing information about
30 how the graphics positions are to be transformed.

The graphics positions can then be printed on a base with a position-coding pattern which codes arbitrary positions by the graphics positions being transformed to graphics positions which conform with positions coded by
35 the position-coding pattern.

The transformation is preferably carried out with the aid of said at least one recorded position as input

signal, so that one of the graphics positions essentially conforms with a position in the position-coding pattern.

This means that a printer automatically transforms the graphics positions with the aid of the position-
5 coding pattern. For instance, the graphics positions are transformed so that the median of the different graphics positions will be in the recorded position which is recorded first.

The printer is preferably adapted to determine a
10 predicted position of the printing means by means of the recorded position and to print when the predicted position conforms with a graphics position in the graphic information.

The predicted position is a position in which the
15 printing means is expected to be located on a subsequent occasion when the printing occurs. Owing to the fact that it takes time to process a recorded image and since it takes a certain time from a signal being emitted that the printing is to occur until the printing actually
20 occurs, the predicted position is not the same as the recorded one.

When the recorded position is the correct position the printing thus occurs. By moving the printing means and the image sensor over all positions on the surface of
25 a base, all the graphic information is printed, provided that the position-coding pattern codes all graphics positions in the graphic information.

According to a less preferred embodiment, the prin-
ter is adapted to print on the surface when the recorded
30 position conforms with a graphics position in the graphic information. This requires that the image-processing be quick or that the printer be moved slowly. If the dye is dispensed without a predicted position being calculated, the possible resolution of the printed image is
35 deteriorated since a certain displacement will arise between the graphics position and the position in which the dye is dispensed. The displacement depends on the

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image-processing speed and the speed of the nozzle.

The position-coding pattern is advantageously arran-
ged as a plurality of symbols in a matrix, each symbol
defining a binary digit for each of two directions. A
5   part of a predetermined size of the matrix unambiguously
defines a coordinate.

The printer is preferably adapted to identify a pre-
determined number of symbols in the recorded image, to
separate the position-coding pattern in the image into
10 a first position code for a first coordinate and a second
position code for a second coordinate by translating each
symbol into at least one digit for the first position
code and at least one digit for the second position code,
and to calculate the first coordinate by means of the
15 first position code and the second coordinate by means
of the second position code.

Preferably, the printing means are arranged adjacent
to the image sensor at one end of the printer. A recorded
position determined by means of the image sensor then
20 conforms with the position of the printing means.

The printer is preferably adapted to determine the
speed and direction of the printing means in relation to
the surface by means of at least two recorded positions
converted from at least two recorded images. This makes
25 it possible to take the movement of the printing means
into consideration when printing.

The printer is advantageously adapted to calculate
the predicted position starting from the last recorded
position and the speed and direction of the printing
30 means.

The printer is advantageously adapted to print only
if the speed of the printing means in relation to the
surface is essentially constant. When the printing means
has a retarding or accelerating movement in relation to
35 the surface, it is difficult to calculate the predicted
position. This means an increased probability for an
error to occur in the printing process.

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The printer is preferably handheld although it is
within the scope of the invention that the printer is
not handheld. The great advantage of the invention is,
however, that it is possible to make the printer extreme-
5   ly small and advantageously handheld. In the case where
the printer is not handheld, the printing means and the
image sensor are movably arranged in relation to a
stationary part of the printer.

The image sensor has advantageously a main viewing
10   direction in which it is adapted to collect radiation
from the surface, the printer being adapted to determine
its turning position in relation to the viewing direction
by means of the recorded image and to print with the aid
of the turning position.

15   By the printer determining its turning position,
it will be possible to take into account the fact that
the printing means are not centred in relation to the
image sensor.

According to a preferred embodiment of the inven-
20   tion, the image sensor thus records an image taken in
a direction relative to the image sensor.

According to an embodiment of the invention, the
printing means are adapted to print in a plurality
of points at the same time. As a result, the printing
25   speed increases.

According to one aspect, the invention provides
a system for printing graphic information, comprising a
printer and a base. The system is characterised in that
the base has a position-coding pattern which codes the
30   absolute coordinates for a plurality of positions on the
base, and the printer comprises printing means for
printing on the base, and further comprises an image
sensor for recording an image of the base, the printer
being adapted to print on the base with the aid of the
35   position-coding pattern in the recorded image and the
graphic information.

According to one aspect, the invention provides a

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method for printing stored graphic information on a sur-
face. The method is characterised by the steps of record-
ing an image of a surface, and print on the surface with
the aid of the recorded image and the stored graphic

5   information.

According to one aspect, the invention provides a
printer which comprises a heating means for heating a
base in order to change its colour. The printer according
to this aspect of the invention is characterised in that

10 it further comprises an image sensor for recording an
image of the surface, the printer being adapted to heat
the base, so that its colour changes, with the aid of the
recorded image.

According to this aspect of the invention, the heat-

15 ing step preferably consists of a spark gap. When a spark
is generated in the spark gap, the sheet of paper is
heated locally at the spark gap. The sheet is heated in
points corresponding to graphic information that is to be
printed.

20 Another method of generating a changed colour is to
expose the paper for a laser beam.

The above features can, of course, be combined in
the same embodiment.

In order to further illustrate the invention,

25 detailed embodiments of the invention will be described
below, without however the invention being considered
to be restricted thereto.

The accompanying drawings are only schematic and,
thus, certain dimensions are greatly exaggerated for

30 the purpose of elucidating the invention.

Brief Description of the Drawings

Fig. 1 illustrates a printer according to a pre-
ferred embodiment of the present invention.

Fig. 2 illustrates a sheet of paper with a pattern

35 adapted to the printer according to the present inven-
tion.

Fig. 3 shows an example of a symbol which can be

used in connection with a printer according to the inven-
tion.

Fig. 4 shows how a pattern according to the present
invention is converted into a recorded position in the
5   form of two coordinates.

Fig. 5 illustrates how an image is composed when
using a printer according to the present invention.

Detailed Description of the Invention

Fig. 1 shows a printer according to a preferred
10   embodiment of the present invention. The printer 1 com-
prises a nozzle in the form of a inkjet head 2 for dis-
pensing ink on a surface, an image sensor 3 in the form
of a CCD for recording an image of the surface, and a
diode 4 for illuminating the surface. In front of the
15   CCD there is a lens system 8 which is intended for imag-
ing the coding pattern on the CCD. The printer 1 also
comprises an image-processing means 5 for processing the
image recorded by the image sensor 3, and a battery 6
which constitutes the power supply for the printer. A
20   communication unit 7 is intended for communication
between the printer and a computer. The image-process-
ing means 5 consists of a microcomputer and comprises a
memory 9 for storage of graphic information. The printer
has buttons 10 for operating the printer 1 and a display
25   11 for presenting information. The information presented
on the display is, for instance, the text that is to be
printed on the sheet of paper. The printer 1 is adapted
to be held by the user's hand and to be passed over a
surface which has a position-coding pattern. The printer
30   has a main viewing direction 50 which is the direction
in which images are recorded. Since the viewing direction
50 does not extend through the inkjet head, it must be
taken into consideration how the pen is turned when ink
is being dispensed.

35   According to an alternative embodiment, the printer
has a plurality of nozzles 2 so that ink can be dispensed
to a plurality of points simultaneously.

The printer is advantageously arranged to indicate when a printing is complete. This indication may be presented on the display 11, or with a separate indication lamp 51.

5   Fig. 2 shows a sheet of paper, which is included in a system according to a preferred embodiment of the present invention and which the printer is adapted to record. The surface of the sheet of paper 12 is provided with a position-coding pattern 13. Fig. 2 is an enlarge-
10   ment of a small part of the position-coding pattern on the surface of the sheet of paper, which pattern consists of a plurality of symbols arranged in a matrix. In Fig. 2, also the area 16 which is recorded by the printer is marked. The printer can determine a position by means
15   of the recorded image of the position-coding pattern.

The position-coding pattern with which the printer is intended to be used can be of the type disclosed in US 5,852,434, where each position is coded by a specific symbol.

20   The position-coding pattern is, however, advantageously of the type disclosed in Applicant's PCT applications WO 00/73983 and PCT/SE00/01895 and WO 01/16691, the contents of which are hereby included in this application by reference, where each position is coded by
25   a plurality of symbols and each symbol contributes to the coding of a plurality of positions.

The position-coding pattern is built up of a small number of types of symbols. An example is disclosed in WO 00/73983 where a large dot represents a "one" and a small
30   dot represents a "zero". Another example is disclosed in PCT/SE00/01895, where four different displacements of a dot in relation to a raster point code four different values.

Figs 3a-d show a symbol which can be used for coding
35   positions in the position-coding pattern on the sheet of paper in Fig. 2 according to a preferred embodiment of the invention. The symbol comprises a virtual raster

point 14, which is represented by the intersection
between the raster lines, and a mark 15 which has the
form of a point. The value of the symbol depends on where
the mark is located. In the example in Fig. 3, there are

5   four possible locations, one on each of the raster lines
extending from the raster points. The displacement from
the raster point is equal to all values. The symbol has
in Fig. 3a the value "0", in Fig. 3b the value "1", in
Fig. 3c the value "2" and in Fig. 3d the value "3". In

10   other words, there are four different types of symbols.
Each symbol can thus represent one of four different
values "0-3".

      Fig. 4 illustrates the appearance of a sequence 17
which is used in the position-coding pattern according

15   to a preferred embodiment of the invention. The sequence
17 comprises 512 values 18 each of which is either "0",
"1", "2" or "3". An arbitrary subsequence 19, 20 with 5
values unambiguously defines a sequence value correspond-
ing to the position of the subsequence in the sequence

20   17. Each subsequence occurs in the sequence only once.
Thus the first subsequence 19 corresponds to the value
"0" and the second subsequence 20 to the value "1". In
Fig. 2, the columns and rows in the matrix consist of
sequences in which the values have been converted into

25   symbols. Sequences of this kind are described in "Pseudo-
Random Sequences and Arrays" by F. Jessie MacWilliams and
Neil J.A. Sloane in "Proceedings of the IEEE" Vol. 64,
No. 12, December 1976.

      Fig. 5 shows a part of the position-coding pattern

30   which is reproduced on the sheet of paper 12 in Fig. 2.
A first matrix 30 in Fig. 5a is the smallest matrix which
unambiguously defines a position. The position-coding
pattern 13 is made up of symbols 31 like those shown in
Fig. 3. In the position-coding pattern, use is made of

35   the four different values to code a binary bit in each
of two orthogonal directions. Thus, the four different
values "0, 1, 2, 3" code the four different bit combina-

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tions (0, 0), (0, 1), (1, 0), (1, 1), where the first
digit in each bit combination relates to a first direc-
tion and a second digit relates to a second direction
which is orthogonal to the first direction. When the
5   printer records the first matrix 30 in Fig. 3, it is
converted to a second matrix 32 with values 33, which
defines the x coordinate, and to a third matrix 34 with
values 35, which defines the y coordinate, by means of
the above-mentioned relationship between values and bit
10 combinations. The second matrix 32 contains subsequences
36 which constitute columns in the second matrix. The
values in the matrix are either "0" or "1". The sub-
sequences are a part of the sequence which has been
described above in connection with Fig. 3. Each sub-
15 sequence thus has a unique sequence value. The five
subsequences in the columns in the second matrix 32
are converted to five sequence values Sx_1, Sx_2, Sx_3, Sx_4
and Sx_5 which define the x coordinate. Similarly, sub-
sequences 37 with values 35 are arranged in rows in the
20 third matrix. These subsequences are also parts of the
sequence in Fig. 4 and are similarly converted to a
second set Sy_1-Sy_5 which defines the position of the dif-
ferent subsequences in the sequence. Subsequently the
difference between adjacent sequence values is calculat-
25 ed, which gives rise to two sets of four difference
values Dx_1-Dx_4 and Dy_1-Dy_4, respectively, $Dx_n=Sx_{n+1}-Sx_n$
modulo R and $Dy_n=Sy_{n+1}-Sy_n$ modulo R, where R is the number
of unique subsequences in the sequence in Fig. 4. Then
the difference values are used to generate an x coordi-
30 nate and a y coordinate.

     The conversion from difference values to coordinates
can be carried out in many different ways. According. to
one embodiment, the subsequences are arranged in such
manner that one of the difference values in each matrix
35 which unambiguously defines a position has an integer
value in the range "0-3". This codes the most signifi-
cant digit. The subsequences are also arranged so that

the x coordinate will be one unit greater when moving one
column in the matrix and so that the y coordinate will be
one unit greater when moving one row in the matrix. Since
the columns in the second matrix in Fig. 5b consist of

5   parts of the sequence in Fig. 4, each of the sequence
values in the two columns Sx_1 and Sx_2 furthest to the left
in the matrix in Fig. 5b will be one unit greater when
moving down one row in the matrix 32. However, Dx_1
remains constant. Consequently, also the x coordinate

10   remains constant when moving downwards in the second
matrix 32.

Fig. 6 illustrates how a printout is built up as the
printer operates. The printer records images of the base
and converts them into positions as described above in

15   connection with Fig. 5. As the printer is being passed
over the sheet of paper, images of the position-coding
pattern are continuously recorded and converted into
positions. In Fig. 6a, a first position 40 and a second
position 41 are marked. The image-processing means is

20   adapted to calculate a predicted position 42 by means of
the first position 40 and the second position 41, by also
the interval between the recording of the two images
being known. The predicted position 42 is compared with
graphics positions which are stored in the memory 9.

25   Since the predicted position 42 conforms with a graphics
position which is stored in the memory, ink is dispensed
from the inkjet head 2. In the same manner, dispensing of
ink from the inkjet head is initiated at all other times
when conformity is obtained between the predicted posi-

30   tion and a graphics position. The interval between the
time of the recording of the image which corresponds to
the second position and the time when the inkjet head is
in the predicted position is used by the printer to con-
vert the recorded image into a position, to calculate a

35   predicted position, to compare the predicted position 42
with the graphic information and to dispense ink. When
the predicted position is calculated, the speed and

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direction of the printer are thus taken into considera-
tion. As the printer is being passed over the surface,
the entire image will thus be built up. This is illu-
strated in Figs 6a-6d. Since the inkjet head is not

5   centred relative to the image sensor in the printer which
is shown in Fig. 1, it is necessary to determine how the
printer is turned for ink to be dispensed in the correct
position. This is carried out by the image-processing
means with the aid of the recorded image.

10   The graphic information thus consists, as mentioned
above, of a number of graphics positions corresponding to
the image which is to be printed. Each point corresponds
to a minimum point which is printed with the inkjet head.
The graphic information corresponds to an image or text

15   which is to be printed. The graphics positions which
define the graphic information can be in an arbitrary
position. The only relevant matter is that their mutual
location is such that they define the graphic informa-
tion. The position-coding pattern possibly codes posi-

20   tions within a completely different area than that in
which the graphics positions are located.

        Fig. 7 illustrates how it is taken into considera-
tion that the position-coding pattern codes other posi-
tions than those present in the graphic information. When

25   a user initiates that the graphic information is to be
printed, a first image of a position-coding pattern is
recorded on a sheet of paper 44, which image is converted
into a start position 43. The start position 43 defines
where a user wants the graphic information to be printed.

30   The graphic information 45 consists of graphics positions
which define an "A". The graphics positions have no
positions in common with the position-coding pattern on
the sheet of paper 44. The graphics positions are
transformed so that a median graphics position 46 will be

35   located in the start position 43. As the printer is then
being passed over the sheet of paper, the graphic infor-
mation is printed in the form of an "A" 47.

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According to an alternative embodiment, use is made of the property that the graphics positions do not coincide with the position-coding pattern. It is then necessary to have access to a sheet of paper with a position-

5   coding pattern which codes precisely the graphics positions which are present in the graphic information to allow it to be printed. The graphic information can be, for example, handwritten text recorded by means of another position-coding pattern than the one used in the

10   printing of the information.

The conversion of text or images can be carried out in a number of ways which can easily be accomplished by a person skilled in the art and will therefore not be described in detail.

15   According to an alternative embodiment of the printer, the nozzle 2 of the printer is replaced with a ball point 52, as shown in fig 8a, which is arranged to be moved to the paper when ink is to be dispensed on the surface.

20   According to another embodiment of the printer, the nozzle 2 of the printer is replaced with a point 53, as shown in fig 8b, and the surface is the surface of a pressure sensitive paper. Pressure sensitive papers are known from the art and are such that they are blackened

25   when a pressure is applied to them. According to this embodiment of the invention the point is arranged to apply a pressure to the paper in positions which correspond to graphics positions in the graphical information.

30   According to still another embodiment of the printer, the nozzle 2 of the printer is replaced with a magnetic point 54, as shown in fig 8c, and the surface which is used is a magnetic paper. Magnetic papers comprise small permanent magnets, which give a certain

35   colour to the paper depending on their orientation in relation to the surface of the paper. According to this embodiment the point is arranged to be that close to the

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surface of the paper in positions corresponding to the
graphical positions so that the magnetic force becomes
large enough for the permanent magnets in these positions
to turn so that a printing is obtained.

5   The embodiments described above are to be considered
as examples only.

A person skilled in the art appreciates that the
above embodiments can be varied in many ways without
departing from the inventive concept. For instance, it is
10   possible to use some other type of symbols in the posi-
tion-coding pattern. Different values can, for instance,
be coded with filled circles of different size.

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CLAIMS

1. A printer comprising means (2) for printing on a
surface and an image sensor (3) for recording an image of
the surface, said printer (1) being adapted to print on
the surface with the aid of the recorded image and gra-
phic information that is to be printed, c h a r a c t -
e r i s e d in that it is adapted to convert the recorded
image into at least one recorded position in the form of
two coordinates, in response to the recorded image con-
taining a position-coding pattern (13) coding at least
one position.

2. A printer comprising a nozzle (2) for dispensing
dye on a surface and an image sensor (3) for recording an
image of the surface, said printer (1) being adapted to
dispense the dye on the surface with the aid of the
recorded image and graphic information that is to be
printed, c h a r a c t e r i s e d in that it is adapted
to convert the recorded image into at least one recorded
position in the form of two coordinates, in response to
the recorded image containing a position-coding pattern
(13) coding at least one position.

3. A printer as claimed in claim 1, c h a r a c -
t e r i s e d in that it further comprises a memory (9)
for storing the graphic information in the form of a
plurality of graphics positions.

4. A printer as claimed in claim 3, c h a r a c -
t e r i s e d in that it is adapted to convert text and
images, which are received by the printer to be printed,
into said plurality of graphics positions.

5. A printer as claimed in claim 1, 3 or 4,
c h a r a c t e r i s e d in that it is adapted to trans-
form the graphics positions in the graphic information in
response to an input signal containing information about
a transformation.

6. A printer as claimed in claim 5, c h a r a c -
t e r i s e d in that the transformation is carried out
with the aid of said at least one recorded position as
the input signal, so that one of the graphics positions
5   .essentially conforms with a position in the position-
coding pattern.

7. A printer as claimed in any one of claims 1 or 3-
6, c h a r a c t e r i s e d in that it is adapted to
print on the surface when the recorded position conforms
10   with a graphics position in the graphic information.

8. A printer as claimed in any one of claims 1 or 3-
6, c h a r a c t e r i s e d in that it is adapted to
determine a predicted position of the printing means (2)
by means of the recorded position, and to print when the
15   predicted position conforms with a graphics position in
the graphic information.

9. A printer as claimed in claim 8, c h a r a c -
t e r i s e d in that the printer is adapted

to determine the speed and direction of the print-
20   ing means (2) in relation to the surface by means of at
least two recorded positions converted from at least two
recorded images, and

to calculate the predicted position starting from
one of the recorded positions as well as the speed and
25   direction of the printing means (2).

10. A printer as claimed in any one of claims 1 or
3-9, c h a r a c t e r i s e d in that it is adapted to
determine the speed and direction of the printing means
(2) in relation to the surface by means of at least two
30   recorded positions converted from at least two recorded
images.

11. A printer as claimed in any one of claims 1 or
3-10, c h a r a c t e r i s e d in that it is adapted

to identify a predetermined number of symbols (15,
35   31) in the position-coding pattern (30) in the recorded
image, and

to separate the position-coding pattern (30) in the
image into a first position code (32) for a first coordi-
nate and a second position code (34) for a second coordi-
nate by translating each symbol into at least one digit
5   for the first position code and at least one digit for
the second position code, and

to calculate the first coordinate by means of the
first position code and the second coordinate by means
of the second position code.

10   12. A printer as claimed in any one of claims 1 or
3-11, c h a r a c t e r i s e d in that it is handheld.

13. A printer as claimed in any one of claims 1 or
3-12, c h a r a c t e r i s e d in that the image sen-
sor (3) has a main viewing direction (50) in which it is

15   adapted to record radiation from the surface, the printer
being adapted to determine its turning position in rela-
tion to the viewing direction (50) by means of the
recorded image, and to print with the aid of the turning
position.

20   14. A printer as claimed in any one of claims 1 or
3-13, c h a r a c t e r i s e d in that the printing
means (2) are adapted to print in a plurality of direc-
tions.

15. A printer as claimed in any one of claims 1 or
25   3-14 c h a r a c t e r i s e d in that the printing means
are a nozzle for dispensing dye on a surface.

16. A system for printing graphic information, com-
prising a printer (1) and a base (12), c h a r a c -
t e r i s e d in that

30   the base (12) has a position-coding pattern (13,
30) which is designed so that an arbitrary subset of the
position-coding pattern (13, 30), said subset having a
predetermined size, codes the absolute coordinates for a
position on the base (12), and

35   the printer (1) comprises printing means (2) for
printing on a base (12), and further comprises an image
sensor (3) for recording an image of the base (12), the

printer (1) being adapted to print on the base (12) with
the aid of the position-coding pattern in the recorded
image (16) and the graphic information.

5   17. A method for printing stored graphic information
on a surface, c h a r a c t e r i s e d by the steps of
        recording an image of a surface, and
        printing on the surface with the aid of the recorded
image and the stored graphic information.

        18. A printer comprising a nozzle (2) for dispensing
10   dye on a surface and an image sensor (3) for recording an
image of the surface, said printer (1) being adapted to
dispense the dye on the surface with the aid of the
recorded image and graphic information that is to be
printed, c h a r a c t e r i s e d in that it is adapted
15   to convert the recorded image into at least one recorded
position in the form of two coordinates, in response to
the recorded image containing a position-coding pattern
(13) coding at least one position, and that it is further
adapted to determine a predicted position of the nozzle
20   (2) by means of the recorded position, and to dispense
the dye when the predicted position conforms with a
graphics position in the graphic information.

        19. A printer comprising means (2) for printing on a
surface and an image sensor (3) for recording an image of
25   the surface, said printer (1) being adapted to print on
the surface with the aid of the recorded image and gra-
phic information that is to be printed, c h a r a c -
t e r i s e d in that it is adapted to convert the
recorded image into at least one recorded position in
30   the form of two coordinates, in response to the recorded
image containing a position-coding pattern (13) coding at
least one position, and that it is further adapted to
determine a predicted position of the nozzle (2) by means
of the recorded position, and to print when the predicted
35   position conforms with a graphics position in the graphic
information.

20. A system for printing graphic information, comprising a printer (1) and a base (12), c h a r a c - t e r i s e d in that

the base (12) has a position-coding pattern (13,
5   30) which is designed so that an arbitrary subset of the position-coding pattern (13, 30), said subset having a predetermined size, codes the absolute coordinates for a position on the base (12), and

the printer (1) comprises printing means (2) for
10   printing on a base (12), and further comprises an image sensor (3) for recording an image of the base (12), the printer (1) being adapted to print on the base (12) with the aid of the position-coding pattern in the recorded image (16) and the graphic information.

15   21. A method for printing stored graphic information on a surface, c h a r a c t e r i s e d by the steps of

recording an image of a surface, and

printing on the surface with the aid of the recorded image and the stored graphic information.

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Fig. 1

Fig. 2

Fig. 4

Fig. 3

Fig. 5

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40   41   42

ANOTO   <u>a</u>

ANOTO   <u>b</u>

ANOTO   <u>c</u>

ANOTO   <u>d</u>

Fig. 6

47
43 A
44

45
A
46   *Fig. 7*
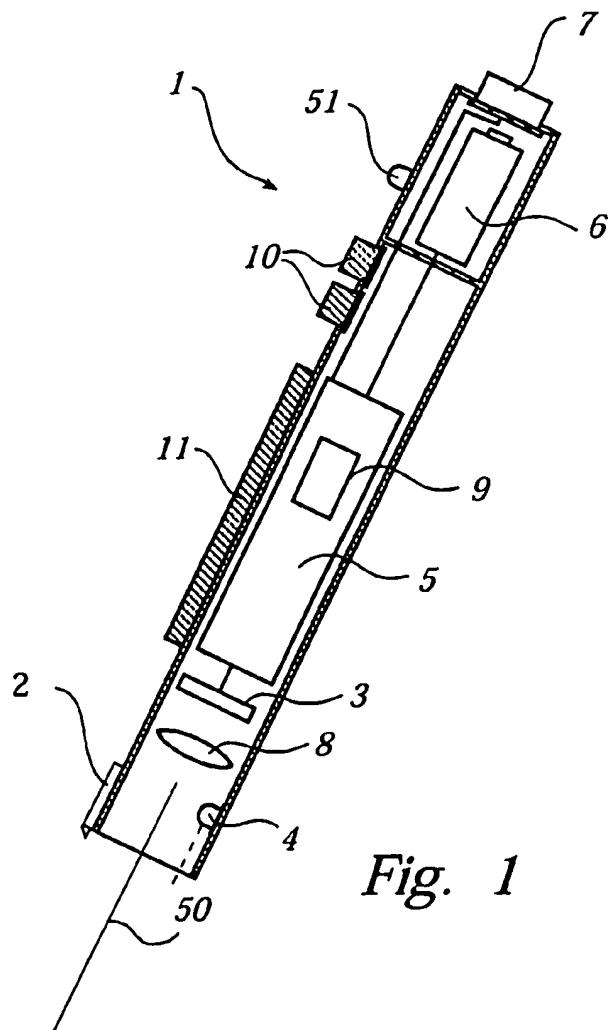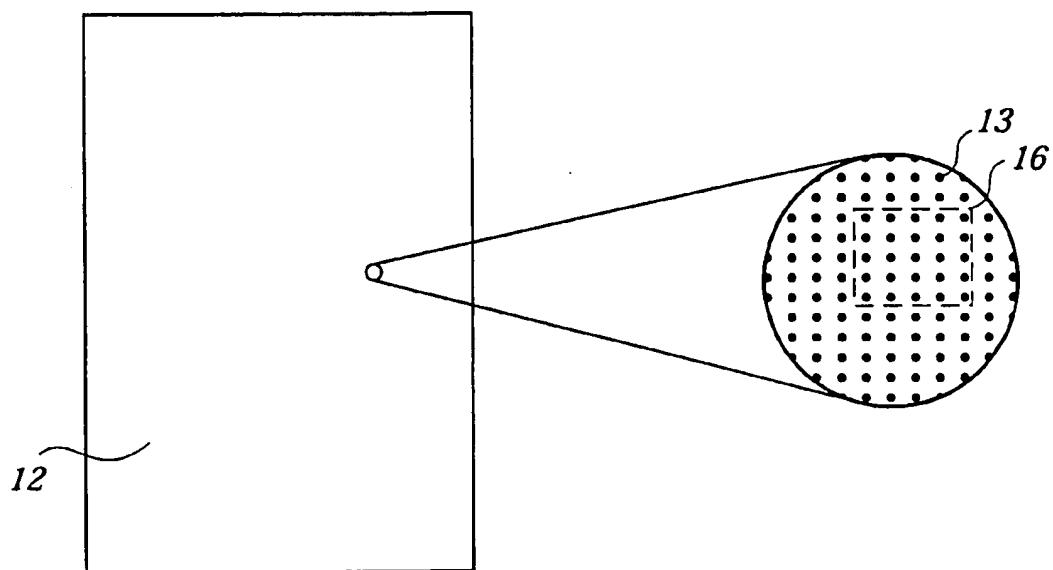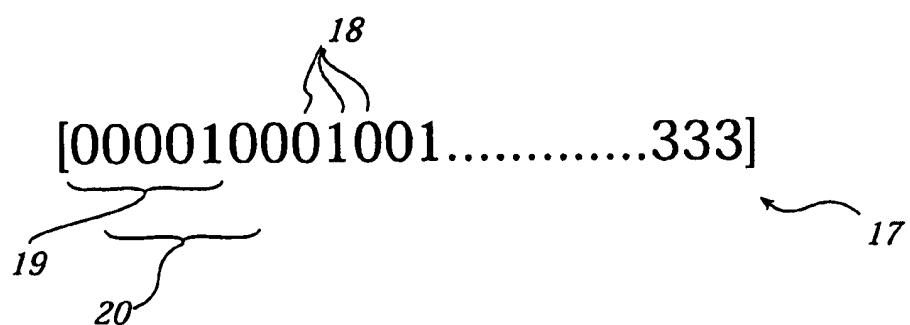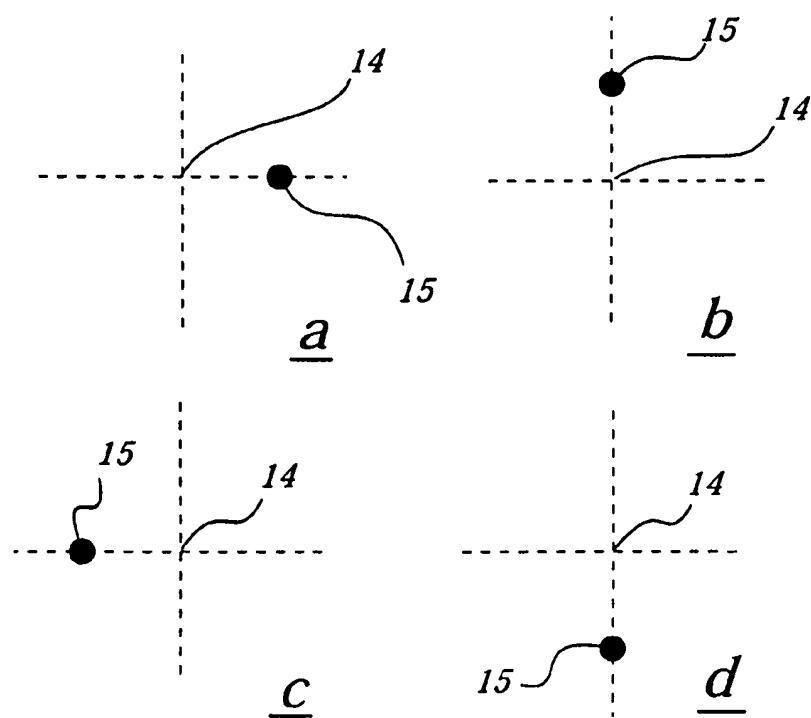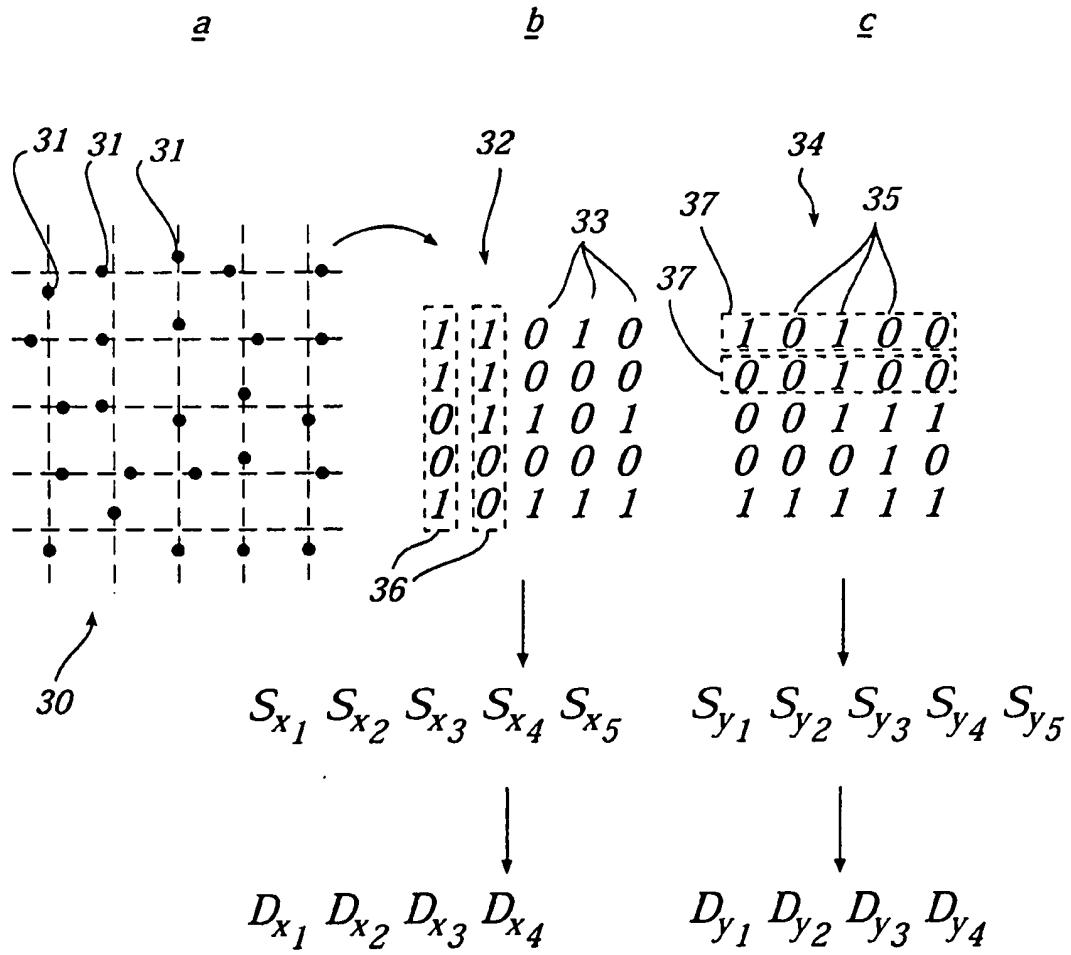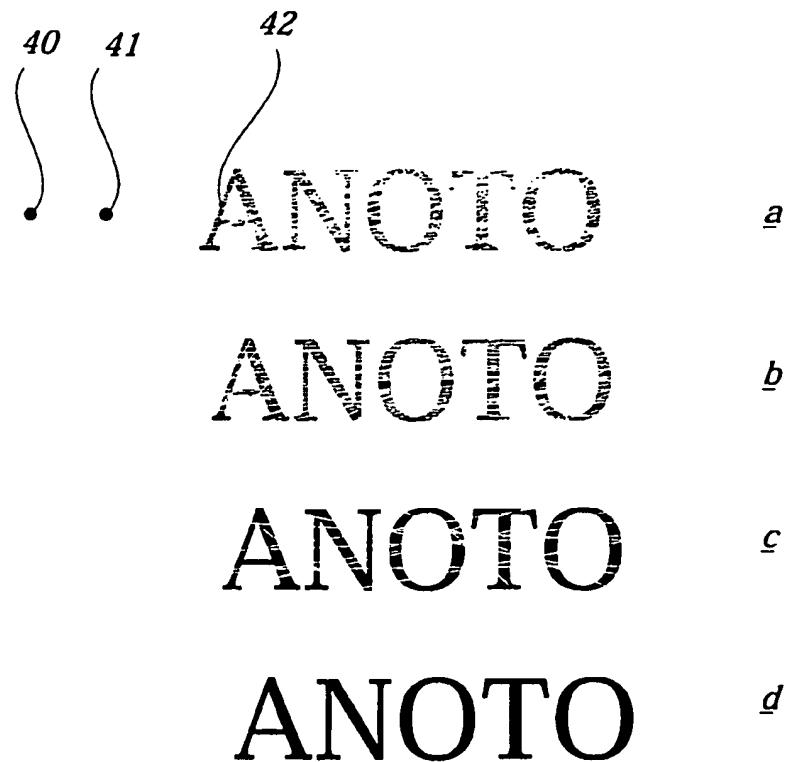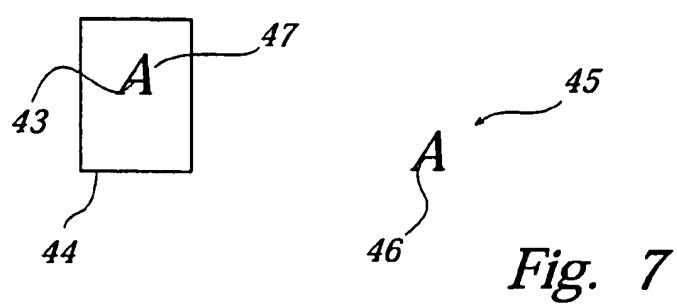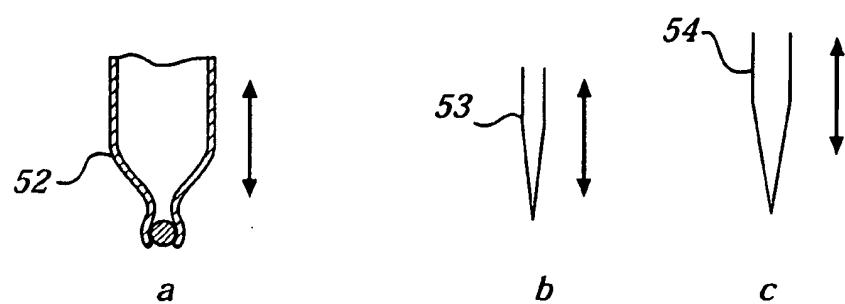
Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/00595

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B41J 3/36 // B41J 2/00, H04N 1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04N, G06K, B41J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI DATA, EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5927872 A (NORIHIDE YAMADA), 27 July 1999 (27.07.99), column 7, line 33 - line 67; column 5, line 13 - line 17, abstract	1-21
	--	
Y	US 5852434 A (ORAL F. SEKENDUR), 22 December 1998 (22.12.98), column 5, line 22 - line 39, see the whole document	1-15,17-19, 21
A		16,20
	--	
A	US 5825995 A (CHRISTOPHER A. WIKLOF ET AL), 20 October 1998 (20.10.98)	1-21
	--	

[X] Further documents are listed in the continuation of Box C.	[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
9 July 2001	11 -07- 2001
Name and mailing address of the ISA: Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer HENRIK ANDERSSON/EE Telephone No. + 46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 01/00595

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	WO 0029218 A2 (ESSELTE N.V.), 25 May 2000 (25.05.00)	1-21

				International application No.
			02/07/01	PCT/SE 01/00595

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US	5852434	A	22/12/98	AU	4529896	A	14/07/97
				US	5477012	A	19/12/95
				WO	9722959	A	26/06/97
US	5825995	A	20/10/98	JP	10029346	A	03/02/98
WO	0029218	A2	25/05/00	AU	6357999	A	05/06/00
				GB	0108469	D	00/00/00
				GB	2343657	A	17/05/00
				GB	9825021	D	00/00/00